

Remarks

Claims 21-37 are now pending in this application. Applicants have amended claims 21 and 29 and cancelled claims 22 and 31 to clarify the present invention. Applicants respectfully request favorable reconsideration of this case.

Applicants submit herewith a certified copy of the priority document. However, Applicants wish to point out that a copy of the priority document should have been received from the international bureau and that Applicants should not be required to submit a copy of the priority document.

Applicants have amended page 3, line 30 of the specification to include a more accurate translation of the original Swedish specification. Accordingly, Applicants respectfully request withdrawal of the objection to the specification.

Applicants submit herewith under separate cover a request to approve drawing corrections and one sheet of replacement drawings including Figs. 4a, 4b and 5. Applicants have amended the drawings to include the legend "Prior Art" to Fig. 5. Applicants have labeled the two parts of Fig. 4 and Fig. 4 and Fig. 4b and amended the specification to reflect this change. As discussed at page 1, lines 12-15 of the specification, Fig. 5 illustrates a moveable element, a fixed element, three driving means and a link device. The distal and proximal halves of the ball of the ball and socket joint are shown in any illustration of the ball. According to dictionary.com, the definition of proximal is "nearest", "proximate" or "nearer to a point of

reference such as an origin, a point of attachment, or the midline of the body". On the other hand, distal is defined as "anatomically located far from a point of reference, such as an origin or a point of attachment." Such characteristics of a body are shown simply by showing the body. Accordingly, these aspects of the joint are shown in the drawing and no changes to the drawing are necessary. Fig. 4a shows grooves in the socket. Fig. 1 shows the grooves engaging and deforming the bearing member since the bearing member is shown installed in the socket. In view of the above, Applicants respectfully request withdrawal of the objection to the drawings.

The Examiner rejected claims 21-28 under 35 U.S.C. § 112, first paragraph. As discussed above, Fig. 5 shows and the specification at page 1, lines 12-15 describe three driving means. Therefore, claims 21-28 comply with 35 U.S.C. § 112, first paragraph and applicants respectfully request withdrawal of this rejection.

The Examiner rejected claims 21-28 under 35 U.S.C. § 112, second paragraph. As discussed above, page 1, lines 12-15 of the specification discusses and Fig. 5 illustrates a moveable element and a fixed element. Therefore, claims 21-28 comply with 35 U.S.C. § 112, second paragraph and applicants respectfully request withdrawal of this rejection.

The Examiner rejects claims 21-37 under 35 U.S.C. § 103(a) as being unpatentable over U.S. patent 4,976,582 to Clavel in view of U.S. patent 2,733,085 to Latzen and U.S. patent 4,430,016 to Matsuoka.

The combination of Clavel, Latzen and Matsuoka does not suggest the present invention

as recited in claims 21 or 29, since, among other things, the combination does not suggest a joint socket enclosing a joint ball with a space approximately one-half the ball or less. The combination also does not suggest a ball and socket joint that includes a bearing member that engages only a distal half of each joint ball or only a portion of the distal half of each joint ball and only a portion of a proximal half of each joint ball. Clavel does not suggest any details regarding the joint. The Examiner cites Latzen as suggesting a ball and socket joint as recited in claims 21 and 29. Latzen does not suggest such a joint. On the contrary, every drawing of Latzen illustrates a ball completely surrounded by a socket housing. The housing even extends about the rod to which the ball is connected in some embodiments.

As described above, proximal and distal define not left and right portions of a structure, but rather near and far portions of a structure. The proximal portions of the ball would be away from the rod that it is attached to and the distal portions those farthest from the rod. Latzen does not suggest a ball and socket structure as recited in claims 21 and 29.

By entirely surrounding the ball and including a bearing surface that extends about the ball where the ball is connected to a rod, the movement of the ball within the socket is quite restricted. The combination of references would include such an arrangement.

On the other hand, the present invention includes a socket that extends about one-half of the ball or less and a bearing member that engages only a distal half of each joint ball or only a portion of the distal half of each joint ball and only a portion of a proximal half of each joint ball. The arrangement of the present invention minimizes friction and provides the delta robot with a

desired degree of freedom of movement of the delta robot. Additionally, the present invention provides a low weight design that can have a stroke time of about 0.5 sec. The present invention also provides an easily replaceable bearing means that may be exchanged regularly to achieve minimized uneven wear.

The arrangement recited in claims 21 and 29 is contrary to the disclosure of Latzen. Along these lines, at col. 1, lines 32-36, Latzen describes how the "narrow dish-shaped" bearing surface is arranged at the exit of the housing. Such an arrangement reduces rather than increases the working envelope. As a result, Latzen does not suggest the present invention particularly due to the restriction that such an arrangement places on the movement of the ball and rod to which the ball is connected. In fact, the restricted movement of the joint suggested by Latzen would make the present invention useless due to minimized movability and excessively high friction in the joint. As a result, the combination of Latzen and Clavel does not make any sense. A person or ordinary skill in the art would not look to Latzen to solve the problem of minimized friction and uneven wear. Referring to the drawings of Clavel and seeing the range of motion of the joints makes it clear that the structure of Latzen is not compatible with such a range of motion.

The joint socket of the present invention as recited in claims 21 and 29 encloses the joint ball with a space approximately one-half the ball or less. Such a structure permits quick disassembly of the joint and change of the bearing member. Since the socket structure of both Latzen and Matsuoka et al. surround the ball of the ball and socket joint, not only would the structures not provide the degree of movement possible with the structure according to the present invention, but they would also not provide the possibility to easily disassemble the joint

and quickly change the bearing member. All of the drawings of Latzen and Matsuoka et al. illustrate socket portions that extend about all or much more than half of the ball of the joint.

By only enclosing approximately one-half of the ball or less the present invention as recited in claims 21 and 29 provides minimal friction in the joint, which helps to provide the robot with a quick stroke time, which may be on the order of about 0.5 seconds. In spite of only covering approximately one-half of the ball or less, the present invention the bearing member is firmly fixed in the socket of the joint, such that the joint can withstand the rotational and directional movements that such joints encounter in use.

In view of the above, the combination of Clavel, Latzen and Matsuoka does not suggest the present invention as recited in claims 21 or 29 or claims 22-28 and 30-37, which depend thereon.

Therefore, the references relied upon in the office action, whether considered alone or in combination, do not suggest patentable features of the present invention. Therefore, the references relied upon in the office action, whether considered alone or in combination, do not make the present invention obvious. Accordingly, Applicants respectfully request withdrawal of the rejections based upon the cited references.

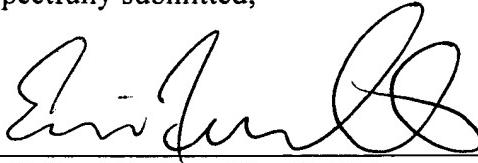
In conclusion, Applicants respectfully request favorable reconsideration of this case and early issuance of the Notice of Allowance.

If an interview would advance the prosecution of this case, Applicants urge the Examiner to contact the undersigned at the telephone number listed below.

The undersigned authorizes the Commissioner to charge fee insufficiency and credit overpayment associated with this communication to Deposit Account No. 22-0261.

Respectfully submitted,

Date: 7/11/06

  
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